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10/728,779	12/08/2003	Kia Silverbrook	MTB14US	2363

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AUSTRALIA

EXAMINER	
UHLENHAKE, JASON S	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/728,779	SILVERBROOK, KIA	
	Examiner	Art Unit	
	JASON S. UHLENHAKE	2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 May 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8-16,18-25,27-35,37-52 and 54* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8-16,18-25,27-35,37-52 and 54* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 5, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) in view of DeMoor et al

Manaka discloses:

- ***regarding claims 1,*** a substrate (figures 2-5) including a plurality of nozzles for supply with an ejectable liquid (second paragraph, page 7 of Manaka translation)

- a nozzle plate having a plurality of ink ejection openings defined therein, each opening corresponding to a respective nozzle, each nozzle having a respective nozzle chamber (Figure 2; Pages 8-9 of Manaka translation)

- a heater corresponding to each of the nozzles respectively, the heater having at least one heater element configured for thermal contact with a bubble forming liquid (Pages 8-9 of Manaka translation)

- drive circuits corresponding to each of the nozzles respectively for controlling the operation of the heater (24) (Page 19 of Manaka translation)

- at least one heater element (16) in the form of a suspended beam having an upper and a lower face in thermal contact with a bubble forming liquid, said beam being parallel with a plane of said nozzle plate (12) (Figures 2-5; Page 11 of the Manaka translation)

- heating the heater element (16) to a temperature above the boiling point of the bubble forming liquid forms a gas bubble that causes the ejection of a drop of the ejectable liquid from the nozzle (Page 10, Lines 3-11 of Manaka translation)

- each heater element (16) is a solid material (page 5 Lines 8-11 of Manaka translation) and configured to be heated to a temperature above the boiling point (Page 10, Lines 3-11 of Manaka translation)

- ***regarding claims 5,*** wherein the bubble forming liquid and the ejectable liquid are of a common body of liquid (Pages 8-9 of Manaka translation)

- ***regarding claims 11***, wherein each heater element has two opposite sides and is configured such that a said gas bubble formed by that heater element is formed at both of said sides of that heater element (Figure 4c; Page 11 of the Manaka translation)

Manaka does not discloses expressly the following:

- ***regarding claims 1,*** the heater element is less than 10 nanograms

DeMoor discloses:

- ***regarding claims 1,*** DeMoor discloses a heater element is less than 10 nanograms (page 285). Fabrication: Ti thickness = 5nm; TiN thickness = 30nm; heater width = 2000 μm; heater width = 0.4 μm. Therefore, the volume of Ti within the heater is $4*10^{-12}$ cm^3, and the volume of TiN within the heater is $2.4*10^{-11}$ cm^3. Using the known densities of Ti = 4.54g/ cm^3 and TiN = 5.22 g/ cm^3, the heater element has an entire mass of 0.14344ng

At the time the invention was made it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of DeMoor into the device of Manaka. The motivation, as shown by Demoor et al, is that these heaters show excellent resistivity uniformity and a low TCR value (page 293, Conclusions)

Claims 19, 23-24, 30, 38, 42-43, 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) in view of DeMoor et al and Tsung Pan (U.S. Pat. 4,894,664)

Manaka discloses:

- ***regarding claims 19, 38,*** a substrate (figures 2-5) including a plurality of nozzles for supply with an ejectable liquid (second paragraph, page 7 of Manaka translation)

- a nozzle plate having a plurality of ink ejection openings defined therein, each opening corresponding to a respective nozzle, each nozzle having a respective nozzle chamber (Figure 2; Pages 8-9 of Manaka translation)

- a heater corresponding to each of the nozzles respectively, the heater having at least one heater element configured for thermal contact with a bubble forming liquid (Pages 8-9 of Manaka translation)

- drive circuits corresponding to each of the nozzles respectively for controlling the operation of the heater (24) (Page 19 of Manaka translation)

- at least one heater element (16) in the form of a suspended beam having an upper and a lower face in thermal contact with a bubble forming liquid, said beam being parallel with a plane of said nozzle plate (12) (Figures 2-5; Page 11 of the Manaka translation)

- heating the heater element (16) to a temperature above the boiling point of the bubble forming liquid forms a gas bubble that causes the ejection of a drop of the ejectable liquid from the nozzle (Page 10, Lines 3-11 of Manaka translation)

- each heater element (16) is a solid material (page 5 Lines 8-11 of Manaka translation) and configured to be heated to a temperature above the boiling point (Page 10, Lines 3-11 of Manaka translation)

- ***regarding claims 24, 42***: wherein the bubble forming liquid and the ejectable liquid are of a common body of liquid (Pages 8-9 of Manaka translation)

- ***regarding claims 30, 47***, wherein each heater element has two opposite sides and is configured such that a said gas bubble formed by that heater element is formed at both of said sides of that heater element (Figure 4c; Page 11 of the Manaka translation)

- ***regarding claim 23***: system configured to support the bubble forming liquid in thermal contact with each heater element, and to support the ejectable liquid adjacent each nozzle (Figures 2-5; Page 11 of the Manaka translation)

- ***regarding claim 43***: method wherein the bubble forming liquid is fed to the at least one heater element so that it substantially surrounds the heater element (Figures 2-5; Page 11 of the Manaka translation)

Manaka does not disclose expressly the following:

- ***regarding claims 19, 38,*** the beam being suspended across a liquid inlet and positioned between the liquid inlet and the opening of the nozzle chamber; the heater element is less than 10 nanograms

DeMoor discloses:

- ***regarding claims 19, 38,*** DeMoor discloses a heater element is less than 10 nanograms (page 285). Fabrication: Ti thickness = 5nm; TiN thickness = 30nm; heater width = 2000 μm; heater width = 0.4 μm. Therefore, the volume of Ti within the heater is $4*10^{-12}$ cm^3, and the volume of TiN within the heater is $2.4*10^{-11}$ cm^3. Using the known densities of Ti = 4.54g/ cm^3 and TiN = 5.22 g/ cm^3, the heater element has an entire mass of 0.14344ng. The motivation, as shown by Demoor et al, is that these heaters show excellent resistivity uniformity and a low TCR value (page 293, Conclusions)

Tsung Pan discloses:

- ***regarding claims 19, 38,*** the beam (15) being suspended across a liquid inlet (11) and positioned between the liquid inlet and the opening of the nozzle chamber

(17) (Figure 3; Column 2, Lines 45-56), for the purpose of reducing resistance to ink flow (Column 2, Lines 3-8), for the purpose of reducing the resistance to ink flow.

At the time the invention was made it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of DeMoor and Tsung Pan, into the device of Manaka for the purpose of reducing the resistance to ink flow and so the heaters show excellent resistivity uniformity and a low TCR value

Claims 2-4, 6, 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoor et al as applied to claim 1 above and further in view of Silverbrook (U.S. Pat. 5,856,836) and Silverbrook (U.S. Pat. 5,796,416)

Manaka as modified by Demoor does not disclose expressly the following:

- ***regarding claims 2- 4,*** the nozzle density is greater than 10,000, 20,000 and 40,000 nozzles per square centimeter
- ***regarding claims 6,*** configured to print on a page and to be a page-width printhead
- ***regarding claims 8:*** each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid causing the ejection of said drop

- ***regarding claims 10:*** printhead comprising a substrate having a substrate surface, wherein the area density of the nozzles relative to the substrate surface exceeds 10,000 nozzles per square cm of substrate surface

- ***regarding claim 9,***: configured to receive a supply of the ejectable liquid at an ambient temperature, where each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, from a temperature equal to said ambient temperature to said boiling point

Silverbrook ('416) discloses:

- ***regarding claims 2-4,*** the nozzle density is greater than 10,000, 20,000 and 40,000 nozzles per square centimeter (Column 5, Lines 39-41, Figure 8)

- ***regarding claims 6,*** configured to print on a page and to be a page-width printhead (Column 22, Lines 51 – 67)

- ***regarding claims 8,:*** each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid causing the ejection of said drop (Column 11, Lines 11 – 20)

- ***regarding claims 10:*** printhead comprising a substrate having a substrate surface, wherein the area density of the nozzles relative to the substrate surface exceeds 10,000 nozzles per square cm of substrate surface (Column 2 Lines 35-40, Column 6 Lines 30-35)

Silverbrook ('836) discloses:

- ***regarding claim 9,*** configured to receive a supply of the ejectable liquid at an ambient temperature, where each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, from a temperature equal to said ambient temperature to said boiling point (Column 4, Lines 59 – 65), for the purpose of reducing power usage and improving reliability and durability of the heater elements

At the time the invention was made it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of DeMoor, Silverbrook ('836) and Silverbrook ('416), into the device of Manaka for the purpose of reducing power usage and improving reliability and durability of the heater elements; allowing higher printing speed and a inkjet printing head that allows easy manufacturing

Claims 20-22, 25, 27-29, 39-41, 44-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoor et al and Tsung Pan (U.S. Pat. 4,894,664) as applied to claim 19 and 38 above and further in view of Silverbrook (U.S. Pat. 5,856,836), Silverbrook (U.S. Pat. 5,796,416)

Manaka as modified by Demoor does not disclose expressly the following:

- ***regarding claims 20-22, 39-41,*** the nozzle density is greater than 10,000, 20,000 and 40,000 nozzles per square centimeter

- ***regarding claims 25***: configured to print on a page and to be a page-width printhead

- ***regarding claims 27, 44:*** each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid causing the ejection of said drop

- ***regarding claims 29, 46:*** printhead comprising a substrate having a substrate surface, wherein the area density of the nozzles relative to the substrate surface exceeds 10,000 nozzles per square cm of substrate surface

- ***regarding claim 28, 45***: configured to receive a supply of the ejectable liquid at an ambient temperature, where each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, from a temperature equal to said ambient temperature to said boiling point

Silverbrook ('416) discloses:

- ***regarding claims 20-22, 39-41,*** the nozzle density is greater than 10,000, 20,000 and 40,000 nozzles per square centimeter (Column 5, Lines 39-41, Figure 8)

- ***regarding claims 25***: configured to print on a page and to be a page-width printhead (Column 22, Lines 51 – 67)

- ***regarding claims 27, 44:*** each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid causing the ejection of said drop (Column 11, Lines 11 – 20)

- ***regarding claims 29, 46:*** printhead comprising a substrate having a substrate surface, wherein the area density of the nozzles relative to the substrate surface exceeds 10,000 nozzles per square cm of substrate surface (Column 2 Lines 35-40, Column 6 Lines 30-35)

Silverbrook ('836) discloses:

- ***regarding claim 28, 45***: configured to receive a supply of the ejectable liquid at an ambient temperature, where each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, from a temperature equal to said ambient temperature to said boiling point (Column 4, Lines 59 – 65), for the purpose of reducing power usage and improving reliability and durability of the heater elements

At the time the invention was made it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of DeMoor, Silverbrook ('836), Silverbrook ('416) and Tsung Pan, into the device of Manaka for the purpose of reducing power usage and improving reliability and durability of the heater elements; allowing higher printing speed and a inkjet printing head that allows easy manufacturing and is especially appropriate for high-density multi-nozzle structures

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoor et al as applied to claim 1 above, and further in view of Domoto et al (U.S. Pat. 4,580,149)

Manaka as modified by DeMoor et al discloses all of the claimed limitations except for the following:

- ***regarding claims 12,*** wherein the bubble which each element is configured to form is collapsible and has a point of collapse, wherein each heater element is configured such that the point of collapse of a bubble formed thereby is spaced from that heater element.

Domoto et al discloses the following:

- ***regarding claims 12,*** wherein the bubble which each element is configured to form is collapsible and has a point of collapse, wherein each heater element (44) is configured such that the point of collapse of a bubble formed thereby is spaced from that heater element (44). (Column 6 Lines 1- 10, 23 – 30)

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of Domoto et al into the device of Manaka as modified by DeMoor et al for the purpose of reducing cavitational force that erodes the heating element.

Claims 31, 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoor et al and Tsung Pan (U.S. Pat.

4,894,664) as applied to claims 19, 38 above, and further in view of Domoto et al (U.S. Pat. 4,580,149)

Manaka as modified by DeMoor and Tsung Pan discloses all of the claimed limitations except for the following:

- ***regarding claims 31, 48,*** wherein the bubble which each element is configured to form is collapsible and has a point of collapse, wherein each heater element is configured such that the point of collapse of a bubble formed thereby is spaced from that heater element.

Domoto et al discloses the following:

- ***regarding claims 31, 48,*** wherein the bubble which each element is configured to form is collapsible and has a point of collapse, wherein each heater element (44) is configured such that the point of collapse of a bubble formed thereby is spaced from that heater element (44). (Column 6 Lines 1- 10, 23 – 30)

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of Domoto et al into the device of Manaka as modified by DeMoor and Tsung Pan for the purpose of reducing cavitational force that erodes the heating element.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoor et al as applied to claim 1 above, and further in view of Chiou et al (U.S. Pat. 3,958,255).

Manaka as modified by DeMoor discloses all of the claimed limitations except for the following:

- ***regarding claims 13*** comprising a structure that is formed by a chemical vapor deposition (CVD), the nozzles being incorporated on the structure.

Chiou et al discloses the following:

- ***regarding claims 13,*** comprising a structure that is formed by a chemical vapor deposition (CVD), the nozzles being incorporated on the structure (Column 4, Lines 45 – 58).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of Chiou et al into the device of Manaka as modified by DeMoor, for the purpose of making an ink jet nozzle structure having a closely spaced array of small orifices (Column 2, Lines 7-10), and using chemical vapor deposition, is well known in the art, and used to grow layers of advanced materials on the surface of a substrate (Column 4, Lines 49-58).

Claims 32, 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoor et al and Tsung Pan (U.S. Pat. 4,894,664) as applied to claim 1 above, and further in view of Chiou et al (U.S. Pat. 3,958,255).

Manaka as modified by DeMoor and Tsung Pan discloses all of the claimed limitations except for the following:

- ***regarding claims 32, 50,*** comprising a structure that is formed by a chemical vapor deposition (CVD), the nozzles being incorporated on the structure.

Chiou et al discloses the following:

- ***regarding claims 32, 50,*** comprising a structure that is formed by a chemical vapor deposition (CVD), the nozzles being incorporated on the structure (Column 4, Lines 45 – 58).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of Chiou et al into the device of Manaka as modified by DeMoor and Tsung Pan the purpose of making an ink jet nozzle structure having a closely spaced array of small orifices (Column 2, Lines 7-10), and using chemical vapor deposition, is well known in the art, and used to grow layers of advanced materials on the surface of a substrate (Column 4, Lines 49-58).

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoor et al as applied to claim 1 above, and further in view of Mizutani (JP 07101058).

Manaka as modified by DeMoor discloses all of the claimed limitations except for the following:

- ***regarding claims 14,*** comprising a structure which is less than 10 microns thick, the nozzles being incorporated on the structure

Mizutani discloses the following:

- ***regarding claims 14,*** comprising a structure which is less than 10 microns thick, the nozzles being incorporated on the structure (Basic-Abstract)

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of Mizutani into the device of Manaka as modified by DeMoor, for the purpose of providing stable printing.

Claims 33, 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoor et al and Tsung Pan (U.S. Pat. 4,894,664) as applied to claims 19 and 38 above, and further in view of Mizutani (JP 07101058).

Manaka as modified by DeMoor and Tsung Pan discloses all of the claimed limitations except for the following:

- ***regarding claims 33, 49,*** comprising a structure which is less than 10 microns thick, the nozzles being incorporated on the structure

Mizutani discloses the following:

- ***regarding claims 33, 49,*** comprising a structure which is less than 10 microns thick, the nozzles being incorporated on the structure (Basic-Abstract)

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of Mizutani into the device of Manaka as modified by DeMoor and Tsung Pan, for the purpose of providing stable printing.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoor et al as applied to claim 1 above, and further in view of Komuro (U.S. Pat. 4,965,594)

Manaka as modified by DeMoor discloses all of the claimed limitations except for the following:

- ***regarding claims 15,*** printhead comprising a plurality of nozzle chambers each corresponding to a respective nozzle, and a plurality of said heater elements being disposed within each chamber, the heater elements within each chamber formed on different respective layers to one another

Komuro discloses:

- ***regarding claims 15,*** printhead comprising a plurality of nozzle chambers (formed between the orifices and heaters) each corresponding to a respective nozzle (orifices 2) (Column 4, Lines 27-29), and a plurality of said heater elements (11A, 21A and 31A) (Column 4, Liens 27-31) being disposed within each chamber, the heater elements within each chamber formed on different respective layers to one another (Figure 2; Column 7, Lines 33-36, Lines 59-61, Lines 65-68)

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of Komuro into the device of Manaka as modified by DeMoor, for the purpose of making gradation recording with constantly stable performance

Claims 34, 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoor et al and Tsung Pan (U.S. Pat. 4,894,664) as applied to claims 19, 38 above, and further in view of Komuro (U.S. Pat. 4,965,594)

Manaka as modified by DeMoor and Tsung Pan discloses all of the claimed limitations except for the following:

- ***regarding claims 34, 51***: printhead comprising a plurality of nozzle chambers each corresponding to a respective nozzle, and a plurality of said heater elements being disposed within each chamber, the heater elements within each chamber formed on different respective layers to one another

Komuro discloses:

- ***regarding claims 34, 51***: printhead comprising a plurality of nozzle chambers (formed between the orifices and heaters) each corresponding to a respective nozzle (orifices 2) (Column 4, Lines 27-29), and a plurality of said heater elements (11A, 21A and 31A) (Column 4, Liens 27-31) being disposed within each chamber, the heater elements within each chamber formed on different respective layers to one another (Figure 2; Column 7, Lines 33-36, Lines 59-61, Lines 65-68)

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of Komuro into the device of Manaka as modified by DeMoor and Tsung Pan for the purpose of making gradation recording with constantly stable performance

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoor et al as applied to claim 1 above, and further in view of Scheu (U.S. Pat. 4,513,298)

Manaka as modified by DeMoor et al discloses all of the claimed limitations except for the following:

- ***regarding claim 16***, wherein each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50.

Scheu discloses the following:

- ***regarding claims 16,*** wherein each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element (phosphorus-diffused silicon) having an atomic number below 50. (Abstract)

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of Scheu into the device of Manaka as modified by DeMoor, for the purpose of heating the heater element with less energy since it is made of a material with a lower mass.

Claims 35, 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoor et al and Tsung Pan (U.S. Pat. 4,894,664) as applied to claims 19 and 38 above, and further in view of Scheu (U.S. Pat. 4,513,298)

Manaka as modified by DeMoore and Tsung Pan discloses all of the claimed limitations except for the following:

- ***regarding claims 35, 52***, wherein each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50.

Scheu discloses the following:

- ***regarding claims 35, 52,*** wherein each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element (phosphorus-diffused silicon) having an atomic number below 50. (Abstract)

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of Scheu into the device of Manaka as modified by DeMoor and Tsung Pan for the purpose of heating the heater element with less energy since it is made of a material with a lower mass.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoor et al as applied to claim 1 above, and further in view of Kubby (U.S. Pat. 5,706,041

Manaka as modified by DeMoore discloses all of the claimed limitations except for the following:

- ***regarding claims 18***, each heater element is substantially covered by a conformal protective coating, the coating of each heater element having been applied

substantially to all sides of the heater element simultaneously such that the coating is seamless.

Kubby discloses the following:

- ***regarding claims 18***, each heater element is substantially covered by a conformal protective coating (Figure 3, element Si_3N_4), the coating of each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless. (Column 4, Lines 38-43)

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of Kubby into the device of Manaka as modified by DeMoore, for the purpose of vaporizing liquid ink, ejecting a sufficient amount of ink from the ejector, properly heating the ink, and protecting the heater

Claims 37, 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manaka (JP 62094347) as modified by DeMoore et al and Tsung Pan (U.S. Pat. 4,894,664) as applied to claims 19 and 38 above, and further in view of Kubby (U.S. Pat. 5,706,041

Manaka as modified by DeMoore and Tsung Pan discloses all of the claimed limitations except for the following:

- ***regarding claims 37, 54***, each heater element is substantially covered by a conformal protective coating, the coating of each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless.

Kubby discloses the following:

- ***regarding claims 37, 54***, each heater element is substantially covered by a conformal protective coating (Figure 3, element Si_3N_4), the coating of each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless. (Column 4, Lines 38-43)

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the teaching of Kubby into the device of Manaka as modified by DeMoore and Tsung Pan, for the purpose of vaporizing liquid ink, ejecting a sufficient amount of ink from the ejector, properly heating the ink, and protecting the heater

Response to Arguments

Applicant's arguments with respect to claims 1-6, 8-16, 18-25, 27-35, 37-52, 54 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason Uhlenhake whose telephone number is (571) 272-5916. The examiner can normally be reached on Monday - Friday 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/JASON S UHLENHAKE/
Examiner, Art Unit 2853
June 11, 2008

/Julian D. Huffman/
Primary Examiner, Art Unit 2853